



**TABLE III**  
DNA Sequence and Primary Amino Acid Structure of a Representative  
Full Length TM Molecule

5	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	asp	gln	glu	asp	glu	arg	ile	val	leu	val	asp	asn	lys	cys	lys	cys	ala	arg
	gat	cag	gaa	gat	gaa	cgt	att	ggt	ctg	ggt	gac	aac	aag	tgc	aag	tgt	gct	cgt
	cta	gtc	ctt	cta	ctt	gca	taa	caa	gac	caa	ctg	ttg	ttc	acg	ttc	aca	cga	gca
10	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
	ile	thr	ser	arg	ile	ile	arg	ser	ser	glu	asp	pro	asn	glu	asp	ile	val	glu
	att	act	tct	aga	atc	atc	cgt	agc	tca	gag	gac	cca	aat	gaa	gat	ata	gtc	gaa
	taa	tga	aga	tct	tag	tag	gca	tcg	agt	ctc	ctg	ggt	tta	ctt	cta	tat	cag	ctt
15	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
	arg	asn	ile	arg	ile	ile	val	pro	leu	asn	asn	arg	glu	asn	ile	ser	asp	pro
	cgt	aac	atc	cgt	atc	atc	gtc	cca	ctg	aat	aac	cgg	gag	aat	atc	tca	gat	cct
	gca	ttg	tag	gca	tag	tag	cag	ggt	gac	tta	ttg	gcc	ctc	tta	tag	agt	cta	gga
20	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
	thr	ser	pro	leu	arg	thr	arg	phe	val	tyr	his	leu	ser	asp	leu	cys	lys	lys
	aca	agt	ccg	ttg	cgc	aca	cgc	ttc	gta	tac	cac	ctg	tca	gat	ctg	tgt	aag	aag
	tgt	tca	ggc	aac	gcg	tgt	gcg	aag	cat	atg	gtg	gac	agt	cta	gac	aca	ttc	ttc
25	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
	cys	asp	pro	thr	glu	val	glu	leu	asp	asn	gln	ile	val	thr	ala	thr	gln	ser
	tgt	gat	cca	aca	gag	gta	gag	ctg	gac	aat	cag	ata	gtc	act	gcg	act	caa	agc
	aca	cta	ggt	tgt	ctc	cat	ctc	gac	ctg	tta	gtc	tat	cag	tga	cgc	tga	gtt	tcg
30	89	90	91	92	93	94	95	96	97	99	100	101	102	103	104	109	110	111
	asn	ile	cys	asp	glu	asp	ser	ala	thr	glu	thr	cys	ser	thr	tyr	asp	arg	asn
	aac	att	tgc	gat	gag	gac	agc	gct	aca	gaa	acc	tgc	agc	acc	tac	gat	agg	aac
	ttg	taa	acg	cta	ctc	ctg	tcg	cga	tgt	ctt	tgg	acg	tcg	tgg	atg	cta	tcc	ttg
35	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129
	lys	cys	tyr	thr	ala	val	val	pro	leu	val	tyr	gly	gly	glu	thr	lys	met	val
	aaa	tgc	tac	acg	gcc	gtg	gtt	ccg	ctc	gtg	tat	ggt	gga	gag	aca	aaa	atg	gtg
	ttt	acg	atg	tgc	cgg	cac	caa	ggc	gag	cac	ata	cca	cct	ctc	tgt	ttt	tac	cac
40	130	131	132	133	134	135	136	137	138	139	140	141						
	glu	thr	ala	leu	thr	pro	asp	ala	cys	tyr	pro	asp	OPA					
	gaa	act	gcc	ctt	acg	ccc	gat	gca	tgc	tat	ccg	gac	(SEQ ID NO:17)					
													tga attc					
													(SEQ ID NO:7)					
45	ctt	tga	cgg	gaa	tgc	ggg	cta	cgt	acg	ata	ggc	ctg	act taag					
													(SEQ ID NO:27)					

TABLE IV  
Oligonucleotides for Construction of Representative Partial TM Genes

5	<u>OLIGO</u>	<u>SEQUENCE</u>
	1:	gat cag gaa gat gaa cgt att gtt ctg gtt gac aac aag tgc aag tgt gct cgt att act t (SEQ. ID NO:46)
10	2:	cta gaa gta ata cga gca cac ttg cac ttg ttg tca acc aga aca ata cgt tca tct tcc t (SEQ ID NO:47)
	1.1:	gat cag aag tgc aag tgt gct cgt att act t (SEQ ID NO:48)
15	2.1	ct aga agt aat acg agc aca ctt gca ctt ct (SEQ ID NO:49)
	1.2ser:	gat cag gaa gat gaa cgt att gtt ctg gtt gac aac aag tgc aag tcc gct cgt att act t (SEQ ID NO:50)
20	2.2ser:	cta gaa gta ata cga gcg gac ttg cac ttg ttg tca acc aga aca ata cgt tca tct tcc t (SEQ ID NO:51)
	1.2val:	gat cag gaa gat gaa cgt att gtt ctg gtt gac aac aag tgc aag gtt gct cgt att act t (SEQ ID NO:52)
25	2.2val:	cta gaa gta ata cga gca acc ttg cac ttg ttg tca acc aga aca ata cgt tca tct tcc t (SEQ ID NO:53)
	3:	cta gaa tca tcc gta gct cag agg acc caa atg aag ata tag tcg aa (SEQ ID NO:54)
30	4	gat acg gat gtt acg ttc gac tat atc ttc att tgg gtc ctc tga gct acg gat gat t (SEQ ID NO:55)
35	5:	cgt aac atc cgt atc atc gtc cca ctg aat aac cgg gag aat atc tca g (SEQ ID NO:56)

5 5.1dg: cgt aac atc cgt atc atc gtc cca ctg aat aac cgg gag cac  
atc tca g (SEQ ID NO:57)

6: acg gac ttg tag gat ctg aga tat tct ccc ggt tat tca gtg  
gga cga t (SEQ ID NO:58)

10 6.1dg: acg gac ttg tag gat ctg aga tgt gct ccc ggt tat tca gtg  
gga cga t (SEQ ID NO:59)

15 7: atc cta caa gtc cgt tgc gca cac gct tcg tat acc acc tgt  
ca (SEQ ID NO:60)

8: gat ctg aca ggt ggt ata cga agc gtg tgc gca  
(SEQ ID NO:61)

20 9: gat ctg tgt aag aag tgt gat cca aca gag gta gag ctg gac  
aat cag ata gtc act gca (SEQ ID NO:62)

9L3Δ: gat ctg tgt aag aag gat gag gac agc gct aca gaa acc tgc  
tg (SEQ ID NO:63)

25 10L3Δ: aat tca gca ggt ttc tgt agc gct gtc ctc atc ctt ctt aca  
ca (SEQ ID NO:64)

9L3ΔKDEL: gat ctg tgt aag aag gat gag gac agc gct aca gaa acc tgc  
tac gag aag gat gag ctg tg (SEQ ID NO:65)

30 10L3ΔKDEL: aat tca cag ctc atc ctt cgc gtc gca ggt ttc tgt agc gct  
gtc ctc atc ctt ctt aca ca (SEQ ID NO:66)

35 9.2Δ3: gat ctg tgt aag aag tct gat atc gat gaa gat tcc gct aca  
gaa acc tgc agc aca tg (SEQ ID NO:67)

10.2Δ3: aat tca tgt gct gca ggt ttc tgt agc gga atc ttc atc gat  
atc aga ctt ctt aca ca (SEQ ID NO:68)

40

5 9.3Δ3/ser68: gat ctg tct aag aag tct gat atc gat gaa gat tac aga ttc  
ttc aga cta tag cta ctt cta a (SEQ ID NO:69)

10.3Δ3/ser68: aat ctt cat cga tat cag act tct tag aca (SEQ ID NO:70)

10 9.3Δ3/val68: gat ctg gtt aag aag tct gat atc gat gaa gat tac caa ttc  
ttc aga cta tag cta ctt cta a (SEQ ID NO:71)

10.3Δ3/val68: aat ctt cat cga tat cag act tct taa cca (SEQ ID NO:72)

15 10: att gtc cag ctc tac ctc tgt tgg atc aca ctt ctt aca ca  
(SEQ ID NO:73)

11: act caa agc aac att tgc gat gag gac agc gct aca gaa acc  
tgc a (SEQ ID NO:74)

20 12: ggt ttc tgt agc gct ctg ctc atc gca aat gtt gct ttg agt  
cgc agt gac tat ctg (SEQ ID NO:75)

13: gc acc tac gat agg aac aaa tgc tac acg gcc gtg gtt ccg  
25 ctc gtg tat ggt gga gag (SEQ ID NO:76)

14: gag cgg aac cac ggc cgt gta gca ttt gtt cct atc gta ggt  
gct gca (SEQ ID NO:77)

30 15: aca aaa atg gtg gaa act gcc ctt acg ccc gat gca tgc tat  
ccg gac tg (SEQ ID NO:78)

16: aat tca gtc cgg ata gca tgc atc ggg cgt aag ggc agt ttc  
cac cat ttt tgt ctc tcc acc ata cac (SEQ ID NO:79)

35 15KDEL: aca aaa atg gtg gaa act gcc ctt acg ccc gat gca tgc tat  
ccg gac aag gat gaa ttg tg (SEQ ID NO:80)

16KDEL: aat tca caa ttc atc ctt gtc cgg ata gca tgc atc ggg cgt  
40 aag ggc agt ttc cac cat ttt tgt ctc tcc acc ata cac  
(SEQ ID NO:81)

5

P1: gat cag gtc gct gcc atc caa gac ccg agg ctg ttc gcc gaa  
gag aag gcc gtc gct gac tcc aag tgc aag tgt gct cgt att  
act t (SEQ ID NO:82)

10

P2: ct aga agt aat acg agc aca ctt gca ctt gga gtc agc gac  
ggc ctt ctc ttc ggc gaa cag cct cgg gtc ttg gat ggc agc  
gac ct (SEQ ID NO:83)

15

Tp1: gc gat gac gac gat aag gcc caa acg gag acc tgt act gtt gcg cct  
cgt gaa cgg caa aac tgc gga ttc ccg gaa (SEQ ID NO:103)

Tp2:

gtt ttg ccg ttc acg agg cgc aac agt aca ggt ctc cgt ttg ggc ctt  
atc gtc gtc atc gct tca (SEQ ID NO:104)

20

Tp3: gta aca ccc tct cag tgc gct aat aaa ggc tgc tgt ttt gat gac acg  
gta cgg ggc gtt ccg tgg tgc ttc (SEQ ID NO:105)

Tp4:

gcc ccg tac cgt gtc atc aaa aca gca gcc ttt att agc gca ctg aga  
ggg tgt tac ttc cgg gaa tcc gca (SEQ ID NO:106)

25

Tp5:

tac ccc aat aca att gac gtt ccg cct gaa gaa gag tgc gag ccg taa g  
(SEQ ID NO:107)

Tp6:

30

aattc tta cgg ctc gca ctc ttc ttc agg cgg caa gtc aat tgt  
att ggg gta gaa gca cca cgg aac (SEQ ID NO:108)



TABLE VI.A

DNA sequence and primary amino acid structure of Domain D1 of TM  
(TM aa residues -2-20)

```

5      -2  -1   1   2   3   4   5   6   7   8   9   10  11  12  13  14  15
      asp gln glu asp glu arg ile val leu val asp asn lys cys lys cys ala
      gat cag gaa gat gaa cgt att gtt ctg gtt gac aac aag tgc aag tgt gct
      tc ctt cta ctt gca taa caa gac caa ctg ttg ttc acg ttc aca cga

10     16  17  18  19  20
      arg ile thr ser arg (SEQ ID NO:25)
      cgt att act t (SEQ ID NO:15)
      gca taa tga aga tc (SEQ ID NO:35)

```

TABLE VII

Peptide and DNA sequence of Domain L3Δ of TM (TM aa residues 66-70 and 92-101)

20

66 67 68 69 70 92 93 94 95 96 97 99 100 101

*asp leu cys lys lys asp glu asp ser ala thr glu thr cys OPA*

(SEQ ID NO:21)

gat ctg tgt aag aag gat gaa gat tcc gct aca gaa acc tgc tg

25

(SEQ ID NO:11)

ac aca ttc ttc cta ctt ctc agg cga tgt ctt tgg acg act taa

(SEQ ID NO:31)

TABLE VII.APeptide and DNA sequence of Domain L3 of TM (TM aa residues 66-101)

5     66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81  
       *asp leu cys lys lys cys asp pro thr glu val glu leu asp asn gln*  
       *gat ctg tgt aag aag tgt gat cca aca gag gta gag ctg gac aat cag*  
       *cta gac aca ttc ttc aca cta ggt tgt ctc cat ctc gac ctg tta gtc*

10     82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97  
       *ile val thr ala thr gln ser asn ile cys asp glu asp ser ala thr*  
       *ata gtc act gcg act caa agc aac att tgc gat gag gac agc gct aca*  
       *tat cag tga cgc tga gtt tcg ttg taa acg cta ctc ctg tcg cga tgt*

15     100  
       *glu thr cys* (SEQ ID NO:24)  
       *gaa acc tgc* (SEQ ID NO:14)  
       *ctt tgg acg* (SEQ ID NO:34)

20

TABLE VIIIDNA and Primary Amino Acid Sequence of T4 Fragment (TM aa residues 102-141)

25     102 103 104 109 110 111 112 113 114 115 116 117 118 119 120 121  
       *ser thr tyr asp arg asn lys cys tyr thr ala val val pro leu val*  
       *gc acc tac gat agg aac aaa tgc tac acg gcc gtg gtt ccg ctc gtg*  
       *acg tcg tgg atg cta tcc ttg ttt acg atg tgc cgg cac caa ggc gag cac*

30     122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138  
       *tyr gly gly glu thr lys met val glu thr ala leu thr pro asp ala cys*  
       *tat ggt gga gag aca aaa atg gtg gaa act gcc ctt acg ccc gat gca tgc*  
       *ata cca cct ctc tgt ttt tac cac ctt tga cgg gaa tgc ggg cta cgt acg*

35     139 140 141  
       *tyr pro asp OPA* (SEQ ID NO:22)  
       *tac cct gac tg* (SEQ ID NO:12)  
       *atg gga ctg act taa* (SEQ ID NO:32)



5

TABLE IX  
DNA Sequence and Primary Amino Acid Sequence of a  
Representative TM Core Element

9 10 11 12 13 14 15 16 17 18 19  
*asp gln lys cys lys cys ala arg ile thr ser*  
*gat cag aag tgc aag tgt gct cgt att act tct*  
*cta gtc ttc acg ttc aca cga gca taa tga aga*

10

20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36  
*arg ile ile arg ser ser glu asp pro asn glu asp ile val glu arg asn*  
*aga atc atc cgt agc tca gag gac cca aat gaa gat ata gtc gaa cgt aac*  
*tct tag tag gca tcg agt ctc ctg ggt tta ctt cta tat cag ctt gca ttg*

15

37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53  
*ile arg ile ile val pro leu asn asn arg glu asn ile ser asp pro thr*  
*atc cgt atc atc gtc cca ctg aat aac cgg gag aat atc tca gat cct aca*  
*tag gca tag tag cag ggt gac tta ttg gcc ctc tta tag agt cta gga tgt*

20

54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70  
*ser pro leu arg thr arg phe val tyr his leu ser asp leu cys lys lys*  
*agt ccg ttg cgc aca cgc ttc gta tac cac ctg tca gat ctg tgt aag aag*  
*tca ggc aac gcg tgt gcg aag cat atg gtg gac agt cta gac aca ttc ttc*

25

92 93 94 95 96 97 99 100 101  
*asp glu asp ser ala thr glu thr cys OPA **Eco RI** (SEQ ID NO:18)*  
*gat gag gac agc gct aca gaa acc tgc tg (SEQ ID NO:8)*  
*cta ctc ctg tcg cga tgt ctt tgg acg act taa (SEQ ID NO:28)*

TABLE XI  
DNA and Primary Amino Acid Sequence of TpS2

5	101 102	
	<i>cys ser asp asp asp asp lys ala gln thr glu thr cys thr val ala pro</i>	
	<i>gc gat gac gac gat aag gcc caa acg gag acc tgt act gtt gcg cct</i>	
	<i>act tcg cta ctg ctg cta ttc cgg gtt tgc ctc tgg aca tga caa cgc gga</i>	
10	<i>arg glu arg gln asn cys gly phe pro gly val thr pro ser gln cys ala</i>	
	<i>cgt gaa cgg caa aac tgc gga ttc ccg gaa/gta aca ccc tct cag tgc gct</i>	
	<i>gca ctt gcc gtt ttg/acg cct aag ggc ctt cat tgt ggg aga gtc acg cga</i>	
	<i>asn lys gly cys cys phe asp asp thr val arg gly val pro trp cys phe</i>	
15	<i>aat aaa ggc tgc tgt ttt gat gac acg gta cgg ggc gtt ccg tgg tgc ttc/</i>	
	<i>tta ttt ccg acg aca aaa cta ctg tgc cat gcc ccg/caa ggc acc acg aag</i>	
	<i>tyr pro asn thr ile asp val pro pro glu glu glu cys glu phe</i>	
		(SED ID NO:26)
20	<i>tac ccc aat aca att gac gtt ccg cct gaa gaa gag tgc gag ccg taa g</i>	
		(SED ID NO:16)
	<i>atg ggg tta tgt taa ctg caa ggc gga ctt ctt ctc acg ctc ggc att cttaa</i>	
		(SED ID NO:36)